

Estimated Numbers of Men and Women Infected with HIV/AIDS in Tijuana, Mexico

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ABSTRACT *Tijuana, Mexico, just south of San Diego, California, is located by the busiest land border crossing in the world. Although UNAIDS considers Mexico to be a country of “low prevalence, high risk,” recent surveillance data among sentinel populations in Tijuana suggests HIV prevalence is increasing. The aim of this study was to estimate the number of men and women aged 15 to 49 years infected with HIV in Tijuana. Gender and age-specific estimates of the Tijuana population were obtained from the 2000 Mexican census. Population and HIV prevalence estimates for at-risk groups were obtained from published reports, community based studies, and data from the Centro Nacional para la Prevención y Control del VIH/SIDA (CENSIDA). Age-specific fertility rates for Mexico were used to derive the number of low and high-risk pregnant women. Numbers of HIV-positive men and women were estimated for each at-risk group and then aggregated. A high growth scenario based on current HIV prevalence and a conservative, low growth estimate were determined. A total of 686,600 men and women in Tijuana were aged 15 to 49 years at the time of the 2000 census. Considering both scenarios, the number of infected persons ranged from 1,803 to 5,472 (HIV prevalence: 0.26 to 0.80%). The majority of these persons were men (>70%). The largest number of infected persons were MSM ($N = 1,146$ to 3,300) and IDUs ($N = 147$ to 650). Our data suggest that up to one in every 125 persons aged 15–49 years in Tijuana is HIV-infected. Interventions to reduce ongoing spread of HIV are urgently needed.*

KEYWORDS HIV prevalence, AIDS, Model, Mexico, Tijuana, Women.

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INTRODUCTION

Although Mexico is considered to be a country of “low prevalence, high risk,” the distribution of HIV infection varies widely from region to region.¹ Mexico’s national cumulative AIDS incidence was 85 per 100,000 in 2004, whereas the northwestern state of Baja California had an AIDS rate of 140 cases per 100,000.¹ This is 65% higher than the national average and the highest among Mexico’s 31 states, second only to Mexico City, Federal District. Roughly half of Baja California’s population is located in the state’s largest municipality, Tijuana.² Recent surveillance data in sentinel populations, such as pregnant women, suggests that HIV prevalence is increasing dramatically in this city.³

A number of factors suggest that residents of Tijuana may be at increasing risk of acquiring HIV infection. The city lies just 20 miles south of San Diego, California, and the land border crossing between these two cities is the busiest in the world—inspecting more than 46 million persons and 14 million vehicles annually.⁴ Tijuana is a common destination for sexual tourism, especially among Americans.⁵ Proximity to the U.S. has also created economic opportunities that attract migrants from other areas of Mexico, as reflected in the fact that over half of Tijuana’s population in 2000 was born outside of Baja, California.⁶ Migration has been linked to lower socio-economic status, power inequalities, social and cultural alienation, a breakdown of family units and fear of deportation and violence, which in turn may increase vulnerability to HIV transmission.^{7–9} In fact, a recent study of 600 Mexican migrant workers in San Diego and Fresno counties reported an HIV prevalence of 0.9%.¹⁰

The Tijuana/San Diego border area is also situated on a major drug trafficking route whereby heroin, cocaine and methamphetamine are smuggled to the U.S.¹¹ “Spillover” from these shipments has created a robust local drug consumption market.^{12–15} Data from the 1998 Mexican national drug addiction epidemiologic surveillance system suggested that the percent of the general population 12–65 years of age reporting having ever used an illegal drug in Tijuana (14.7%) was almost three times that of Mexico’s national average (5.3%).¹²

Surveillance data suggests that HIV/AIDS appears to be especially concentrated among men having sex with men (MSM).^{16,17} Prevalence of HIV infection among pregnant women remains low but is significantly higher than in the general population.³ Among 1,064 women in labor in Tijuana, HIV prevalence was 1.1% overall, <1% among non-drug using women and 6% among women using drugs or whose partners were users.³ These data are in stark contrast to earlier studies that found HIV prevalence to be 0.09% in pregnant women and 0.3% in the general adult population and suggest that HIV prevalence may be increasing among high-risk Tijuana subpopulations.⁵ In light of these recent data and a lack of more comprehensive epidemiological surveillance, the purpose of this study was to estimate the current number of adult men and women infected with HIV in Tijuana.

MATERIALS AND METHODS

Two population-based models of HIV seroprevalence were developed using available population and HIV prevalence data. The default—or the low growth model—was based on moderate assumptions about the size of the at-risk populations and HIV prevalence while the high growth scenario was based on the upper range of what was expected in these at-risk populations.

Both models were derived from Mexican census data for the Tijuana population aged 15 to 49 years. The models were limited to this age group as it was assumed that these men and women would be at highest risk of contacting HIV infection. Six risk groups were modeled—MSM, injection drug users (IDUs), female sex trade workers (FSWs), high-risk pregnant women, and low-risk women and men. Estimates of the number of infected were also derived by sex and for the total Tijuana population.

Estimates of the population and HIV prevalence in these six at-risk populations were obtained through extensive literature searches and personal communications. We initially performed a broad search of standard medical and social science databases (e.g., PubMed and PsycINFO) using keywords such as HIV, AIDS, Tijuana, and Mexico. We then expanded our search to non-indexed major databases (e.g., LILACS), health and policy related websites maintained by federal and state governmental offices in Mexico and the United States, and abstracts of relevant conferences (e.g., International Conference on AIDS). Finally, data was obtained from Mexican government officials and members of non-governmental organizations (Table 1). All data were reviewed by our collaborators at the Centro Nacional para la Prevención y Control del VIH/SIDA (CENSIDA), Secretaría de Salud, Mexico City, Mexico, the agency responsible for HIV/AIDS surveillance in Mexico.

Multiplying the number of people at-risk, for a particular group, by the HIV prevalence for that same group, derived the estimated number of people infected. The low risk scenario was based on the lower end of the prevalence and population estimate range for each group, whereas the high-risk scenario was based on taking the upper estimates of HIV prevalence and population size. Estimates of the total number infected were based on tallying all estimates for each at-risk group. Sex-specific estimates took into account the proportion in at-risk groups that were of a particular sex.

TABLE 1. Model parameters, data sources, and values used

Key parameters	Sources	Values used
<i>Population data</i>		
Tijuana total and low risk populations	Mexican 2000 Census ²	Age and sex specific
Gay and bisexual males	Diamond, M (1993) ¹⁸	Proportion of total male population
Injection drug users	CENSIDA surveys ^{19,20} National survey on Addictions ¹²	Count/sex ratio
Female sex workers	Community based study of female sex workers ²¹	Count
Pregnant women	Mexican 2000 Census ²	Estimate
<i>HIV prevalence</i>		
Gay and bisexual men	Various community-based seroprevalence surveys ^{16,22,23}	Cross-sectional estimates
Injection drug users	CENSIDA survey ²⁰	Cross-sectional estimates
Female sex workers	Community based study of female sex workers ²¹	Cross-sectional estimates
Pregnant women	Hospital based data ³	Cross-sectional estimates
Low-risk men and women	Various surveys ^{16,25}	Cross-sectional estimates

RESULTS

HIV prevalence data and population estimates of various at-risk subpopulations were obtained to calculate the current HIV prevalence in adults 15–49 years in Tijuana (Tables 1 and 2). The gender and age distribution of the Tijuana population was obtained from the year 2000 Mexican Census.² MSM were estimated to comprise 3–5% of the total male population 15–49 years.¹⁸ The number of IDUs was based on a 2003 CENSIDA survey of 35 zones of the city, which found roughly 6,400 IDUs in shooting galleries and outdoor injection sites.¹⁹ However, this survey indicated that only 60% of IDUs regularly inject in such venues, suggesting that the total number of IDUs may be as high as 10,000.²⁰ The sex distribution of the IDU population was based on the 1998 National Survey on Addictions [Encuesta Nacional de las Adicciones], which found the ratio of men to women who had ever used an illicit drug in their lifetime to be 6:1 in Tijuana.¹² The FSW population was estimated to range from 4,850 to 9,000 based on the number of registered sex workers in Tijuana ($n = 4,850$) and the estimated number of unregistered sex workers.²¹ Age-specific fertility rates for Mexico were obtained from the 2000 Mexican Census and were assumed to be similar between high and low-risk women.² This was combined with local HIV and behavior data to derive the number of high-risk pregnant women.^{2,3}

HIV prevalence estimates for Tijuana were based on a variety of serosurveillance and community based seroprevalence studies (Table 2). High and low estimates of HIV-infected MSM were obtained from published local survey results.^{16,22,23} Cross-sectional serosurveys conducted by CENSIDA in 2003²⁰ and by our group in 2005²⁴ were used to estimate the HIV prevalence range among IDUs.²⁰ Recent data from an ongoing study of FSWs provided the likely range of HIV prevalence in female sex workers.²¹ HIV prevalence in high-risk pregnant women was derived from a hospital-based study of women seeking prenatal care or admitted in labor during 2003–2004.³ The percentage of HIV infection in low-risk persons aged 15–49 years was based on data obtained from regional and national surveys.^{16,25}

TABLE 2. Input assumptions for total population and HIV prevalence for Tijuana population ages 15–49 years, by scenario and group

Variable	Model parameters	
	Population*	HIV prevalence
<i>Total population</i>		
Males	347,300	—
Females	339,300	—
Total	686,600	—
<i>Transmission groups</i>		
Gay and bisexual men	10,400–17,400	11–19% ^{16,22,23}
Injection drug users	6,400–10,000	2.3–6.5% ²⁰
Sex trade workers	4,850–9,000	4.8% ²¹
High-risk pregnant women	2,900	5.6–11.6% ³
Low risk women 15–49 years	326,000–330,600	0.01–0.10% ^{16,25}
Low-risk men 15–49 years	321,400–331,400	0.01–0.10% ^{16,25}

* = Rounded to the nearest hundred.

TABLE 3. Estimated number of persons infected with HIV in Tijuana, by gender and transmission group

Variable	HIV infected	
	Low	High
<i>Total population</i>		
Males	1,305	4,177
Females	498	1,295
Total	1,803	5,472
<i>Transmission groups</i>		
Gay and bisexual men	1,146	3,300
Injection drug users	147	650
Sex trade workers	233	432
High-risk pregnant women	211	436
Low risk women 15–49 years	33	334
Low-risk men 15–49 years	33	321

Table 3 provides current estimates of HIV prevalence and the estimated number of persons living with HIV/AIDS by sex and transmission group. Estimates were based on figures from the low and high-risk scenarios. Considering both scenarios, the number of infected persons ranged from 1,803 to 5,472 (HIV prevalence: 0.26 to 0.80%). The majority of these persons were men (>70%). The largest number of infected persons were MSM ($N = 1,146$ to 3,300), and IDUs ($N = 147$ to 650).

DISCUSSION

An estimated 1.2 million people live in Tijuana, with 57% between the ages of 15–49 years and 49% being women. Based on the high growth scenario, our data suggest that up to one in every 125 persons aged 15–49 years in Tijuana is HIV-infected. According to criteria established by UNAIDS/WHO, the state of the HIV epidemic in Tijuana has moved from low-level to concentrated and could become generalized if the HIV prevalence among sentinel populations is consistently above 1%.²⁶

Our model suggests that transmission in high-risk groups, such as MSMs and IDUs, may be driving the HIV epidemic in Tijuana. However, there is substantial overlap between MSMs and IDUs in Tijuana. A study by Magis-Rodriguez et al. found that among a sample of 352 male IDUs in Tijuana, 48% reported having ever had sex with another male.²⁰ Similarly, among 187 male IDUs recruited in Tijuana through respondent-driven sampling in 2005, 47% reported having ever had sex with another male (Strathdee et al. unpublished data). Since MSM who also inject drugs are known to have high HIV incidence in other settings,^{27,28} it is important to implement targeted interventions for both populations and subgroups of MSM-IDUs before a more generalized epidemic develops.

There is also concern that the number of HIV-infected women may rise in Tijuana. Our analyses suggest that the number of HIV-infected women in Tijuana between ages 15 and 49 may be as low as 498 or as high as 1,296. A qualitative study conducted in 2004 found that FSWs in Tijuana seldom negotiated the use of condoms, had a low knowledge regarding the proper use of condoms, and did not like to use condoms with clients because they were perceived as uncomfortable.²⁹

An ongoing quantitative study among FSWs in Tijuana recently found that injection of vitamins and illicit drugs (e.g. methamphetamine, cocaine) was common among FSWs in Tijuana.²¹ The link between drug use and HIV in pregnant women in Tijuana further suggests that HIV could soon become more generalized in Tijuana unless immediate preventive actions are taken.³ Since the latter study was conducted, HIV antibody screening of pregnant women in Tijuana is now becoming routine, and provisions have been made for administering antiretrovirals to HIV-positive pregnant women.

Our model provides a snapshot of the current HIV situation in Tijuana; however, comparison with earlier figures suggests the situation is dynamic. While studies conducted in 1987 and 1988 found that HIV prevalence was 0.5–1% in FSWs,^{23,30} more recent surveys of HIV in this sub-population found prevalence near 5%.²¹ Further, while studies throughout the late 1980s and 1990s consistently found HIV prevalence to be less than 2% among IDUs,^{13,23} recent prevalence data range from 2.3 to 6.5%.²⁰ A rise in HIV prevalence among IDUs in Tijuana is hardly surprising given that HCV prevalence is 96%,²⁴ needle sharing and the use of shooting galleries are normative, there is no formal needle exchange program, and pharmacists often refuse to sell syringes to drug users despite its legality.³¹ These changes in HIV prevalence over time indicate that there is a need to study the temporal trend of HIV incidence in order to make future projections that inform health policy planning efforts.

The current estimates of HIV prevalence in Tijuana suggest the need for expanding HIV prevention and treatment efforts and developing culturally appropriate interventions for high-risk populations in the Mexico–U.S. border region. Despite Mexico's policy of providing 'universal coverage' for antiretrovirals, supplies are commonly inadequate and sporadic, and there is a lack of specialized medical providers. A recent survey of IDUs found that only half had ever had an HIV test.²⁰ The mobility of the Tijuana population is also of concern for identifying and treating persons with HIV infection. A recent survey of 116 HIV positive residents in Tijuana found that 64% crossed the border to the U.S. at least once per month in the past year.³² This has implications for preventing HIV transmission as well as logistical issues in providing medical care to patients.

Any model is only as valid as the data it incorporates. Our work was limited in that there is a dearth of reliable data on HIV incidence and prevalence in Tijuana. For this reason, we incorporated data from a variety of reliable sources to create a likely range of the true HIV prevalence estimate for each subpopulation. Although we made an effort to include known risk groups, it is possible that our model lacks data on unknown risk groups. Further, we did not include data on prisoners, which has been found to be a population at high risk for HIV infection.^{17,33} Past studies have shown that nearly 100% of HIV-infected prisoners are also IDUs; therefore, we intentionally omitted this group to avoid the possibility of double-counting. This may have led to an underestimation of the number of HIV cases due to drug use in the city. On the other hand, there is a substantial overlap between MSM and IDU populations in Tijuana, and as we included both of these groups in the model, this may have led to an overestimation of HIV cases.

The prevalence of HIV in Tijuana is likely also affected to some extent by migrant workers.²² As many persons pass through Tijuana en route to the U.S. or other parts of Mexico, migration may have implications both on the introduction of new HIV infections to the city, as well as dissemination of HIV to other parts of the U.S. and Mexico. However, as there are no reliable estimates of the number and

duration of stay of such migrants and in particular of those migrants who inject drugs, are MSM or are female or male sex workers or their clients, we did not include migrants in our model. The underlying population structure of our model was based on the most recent general census of Tijuana, conducted in 2000.² As the city has been growing at a rate of approximately 5% per year, it is likely that the current number of HIV positive persons in the city is higher than our estimates.

The greatest uncertainty in the model was in the estimates of subgroup populations. To our knowledge, there are no firm estimates of the number of MSM in Mexico; if the proportion of all adult males who engage in sex with other males is greater than 5%, our estimates of HIV positive MSM in Tijuana may be grossly underestimated. Since injection drug use is an illegal activity, there are no valid estimates of the number of IDUs in Tijuana; however, it has long been recognized that Tijuana has the most serious drug abuse problem in Mexico. While we can be fairly confident about the number of registered FSW in Tijuana, since this is a municipal requirement, the number of unregistered FSWs, who are likely to engage in higher risk behaviors, is less reliable.

Despite the limitations of our models, even the low growth scenario suggests that HIV/AIDS should be considered a public health priority along the Mexico–U.S. border. Our study indicates that nationwide statistics of HIV/AIDS in Mexico mask a dynamic sub-epidemic along the Mexico–U.S. border, whereby “pockets” of HIV infection likely exist among subgroups of IDUs, MSM and sex trade workers in Tijuana. Our modeling scenario, accounting for current HIV prevalence estimates, indicates that up to one in 125 persons aged 15–49 years in Tijuana may be infected with HIV. In addition to the need to develop culturally appropriate interventions targeted to MSMs, IDUs and other at-risk groups, expansion of free HIV voluntary testing and counseling is needed. As Tijuana is situated on the busiest land border crossing in the world, evidence of high-risk behaviors and rising HIV prevalence has important implications for both Mexico and the U.S.

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